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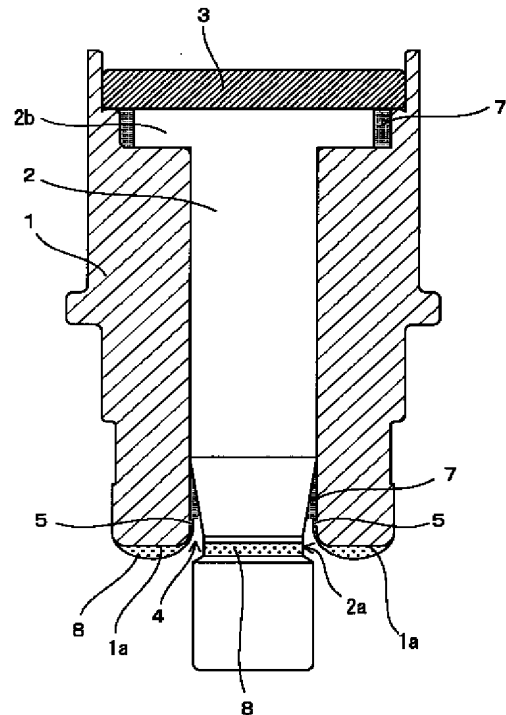
3J016 AA02 BB18

(54) 【発明の名称】 流体軸受装置

(57) 【要約】

【課題】 撥油膜の軸受内部への流入がなく、しかも不要な個所への付着のない信頼性の高い流体軸受装置を提供する。

【解決手段】 潤滑油7の液界面付近と撥油剤8の塗布領域との間の区間におけるスリーブ1に環状の凸部5を形成して、撥油剤8の軸受内部への流入を防ぐ。撥油剤8の塗布領域の表面粗さを撥油剤が塗布されていない軸体もしくは回転体の表面粗さよりも粗くする。



【特許請求の範囲】

【請求項 1】軸体とこの軸体によって回転自在に支持された回転体との間に潤滑油を充填し、前記潤滑油の液界面付近の軸体もしくは回転体に前記潤滑油の漏洩を防止する撥油剤を塗布した流体軸受装置であって、前記潤滑油の液界面付近と前記撥油剤の塗布領域との間の区間における前記回転体の側に環状の凸部または凹部を形成した流体軸受装置。

【請求項 2】軸体とこの軸体によって回転自在に支持された回転体との間に潤滑油を充填し、前記潤滑油の液界面付近の軸体もしくは回転体に前記潤滑油の漏洩を防止する撥油剤を塗布した流体軸受装置であって、前記撥油剤の塗布領域の表面粗さを前記撥油剤が塗布されていない前記軸体もしくは回転体の表面粗さよりも粗くした流体軸受装置。

【請求項 3】軸体とこの軸体によって回転自在に支持された回転体との間に潤滑油を充填し、前記潤滑油の液界面付近の軸体もしくは回転体に前記潤滑油の漏洩を防止する撥油剤を塗布した流体軸受装置であって、前記潤滑油の液界面付近と前記撥油剤の塗布領域との間の区間における前記回転体の側に環状の凸部または凹部を形成するとともに、前記撥油剤の塗布領域の表面粗さを前記撥油剤が塗布されていない前記軸体もしくは回転体の表面粗さよりも粗くした流体軸受装置。

【発明の詳細な説明】

【0001】

【発明の属する技術分野】本発明は、磁気記録装置等のスピンドルモータに用いられる流体軸受装置に関するものである。

【0002】

【従来の技術】磁気記録装置などのスピンドルモータには、流体軸受装置が使用されている。図 3 に示すように、シャフト 2 の一端にスラスト板 2 b が固定され、軸体が構成される。シャフト 2 の外周にはスリーブ 1 が配置され、スリーブ 1 の一端にはスラスト板 2 b と対向するようにスラストフランジ 3 が取り付けられて回転体が構成される。スリーブ 1 とスラストフランジ 3 との接続領域は、接着剤にて封止されている。軸体と軸受体との間には潤滑油 7 が充填され、回転体が軸体によって回転自在に支持される。4 は、スリーブ 1 の開口部である。

【0003】軸体と回転体との間に充填された潤滑油 7 は、表面張力によって軸受内部に保持されているが、軸受装置の回転駆動により潤滑油 7 が飛散したり滲み出したりすると、軸受の回転不良や外部への汚染を生じるため、例えば、特開平 7-31094 号公報などに記載のように、潤滑油 7 の液界面付近に潤滑油 7 をはじく撥油剤を塗布して潤滑剤 7 の滲み出しや流出を防いでいる。ここでは、潤滑油 7 の液界面付近におけるスリーブ 1 の端面 1 a とシャフト 2 の小径部 2 a に、撥油剤 8 を塗布

している。

【0004】

【発明が解決しようとする課題】しかしながら、撥油剤 8 はその塗布性に劣り、上記のように潤滑油 7 の液界面付近におけるスリーブ 1 の端面やシャフト 2 の小径部 2 a に撥油剤 8 を塗布する際に、塗布する必要のない部分に付着したり、塗布量が多い場合には軸受内部に流入して潤滑油 7 に混入するなど、安定した塗布が行えないという問題があった。

10 【0005】そのため、撥油剤 8 を溶剤で希釈して流動性を高めて作業性を向上させる方法が取られているが、希釈の調整が難しく、また、希釈しすぎると塗布後の撥油剤 8 が流れて撥油剤 8 の塗布を必要としない個所にも付着することがあり、拭き取り作業などの修整工程が必要となり、多大な工数を要するという問題がある。

【0006】本発明は前記問題点を解決し、撥油剤の軸受内部への流入がなく、しかも不要な個所への付着のない信頼性の高い流体軸受装置を提供することを目的とする。

20 【0007】

【課題を解決するための手段】本発明の流体軸受装置は、潤滑油の液界面付近と撥油剤の塗布領域との間の区間における回転体に、撥油剤の軸受内部への流入を防ぐ凸部または凹部を形成したことを特徴とする。

【0008】この構成によると、撥油剤の軸受内部への流入を防いで信頼性の高い流体軸受装置が実現できる。本発明の流体軸受装置は、撥油剤の塗布領域の表面粗さを塗布されていない領域の表面粗さよりも粗くしたことを特徴とする。

30 【0009】この構成によると、撥油剤の付着力を高めて安定した撥油剤の塗布が行えるため、信頼性の高い流体軸受装置が実現できる。本発明の流体軸受装置は、潤滑油の液界面付近と撥油剤の塗布領域との間の区間における回転体に、撥油剤の流入を防ぐ凸部または凹部を形成するとともに、撥油剤の塗布領域の表面粗さを塗布されていない領域の表面粗さよりも粗くしたことを特徴とする。

【0010】この構成によると、より一層信頼性の高い流体軸受装置が実現できる。

40 【0011】

【発明の実施の形態】本発明の請求項 1 記載の流体軸受装置は、軸体とこの軸体によって回転自在に支持された回転体との間に潤滑油を充填し、前記潤滑油の液界面付近の軸体もしくは回転体に前記潤滑油の漏洩を防止する撥油剤を塗布した流体軸受装置であって、前記潤滑油の液界面付近と前記撥油剤の塗布領域との間の区間における前記回転体の側に環状の凸部または凹部を形成したことを特徴とする。

【0012】本発明の請求項 2 記載の流体軸受装置は、軸体とこの軸体によって回転自在に支持された回転体と

の間に潤滑油を充填し、前記潤滑油の液界面付近の軸体もしくは回転体に前記潤滑油の漏洩を防止する撥油剤を塗布した流体軸受装置であって、前記撥油剤の塗布領域の表面粗さを前記撥油剤が塗布されていない前記軸体もしくは回転体の表面粗さよりも粗くしたことを特徴とする。

【0013】本発明の請求項3記載の流体軸受装置は、軸体とこの軸体によって回転自在に支持された回転体との間に潤滑油を充填し、前記潤滑油の液界面付近の軸体もしくは回転体に前記潤滑油の漏洩を防止する撥油剤を塗布した流体軸受装置であって、前記潤滑油の液界面付近と前記撥油剤の塗布領域との間の区間における前記回転体の側に環状の凸部または凹部を形成するとともに、前記撥油剤の塗布領域の表面粗さを前記撥油剤が塗布されていない前記軸体もしくは回転体の表面粗さよりも粗くしたことを特徴とする。

【0014】以下に、本発明の実施の形態を図1と図2を用いて説明する。なお、上記従来例を示す図3と同様の構成をなすものには同一の符号を付けて説明する。

【0015】図1に示すように、図3と同様に構成された流体軸受装置において、この実施の形態では、潤滑油7の液界面付近と撥油剤8の塗布領域との間の区間におけるスリーブ1の内周面に、撥油剤8の軸受内部への流入を規制するガード部として、図2(a)に示すように、環状の凸部5が形成されている。環状の凸部5は、ここでは、その厚みが約0.02mm、幅が約0.5mmとなるように形成されている。

【0016】また、スリーブ1の端面1aから凸部5にかけての撥油剤8が塗布される領域の表面粗さは、撥油剤8の付着力を高めて撥油剤8の流動を規制するようスリーブ1の他の部分の表面粗さよりも大きくなるよう形成されており、さらに、シャフト2の小径部2aの表面粗さもシャフト2の他の部分よりもその表面粗さが大きくなるよう形成されている。具体的には、スリーブ1およびシャフト2の撥油剤8の塗布領域の表面粗さを2 μ m～6 μ m程度、撥油剤8が塗布されない部分の表面粗さを0.35 μ m程度としている。

【0017】このように構成された流体軸受装置は、以下のように作製される。開口部4側の内周面に環状の凸部5が形成されたスリーブ1の凸部5から端面1aにかけての塗布領域に、適切な流動性が得られるよう溶剤で希釈された撥油剤8が刷毛などにより塗布される。また、シャフト2の小径部2aについても同様に撥油剤8が塗布される。撥油剤8や溶剤は特に限定されるものではないが、撥油剤8の希釈率は、90%以上を溶剤とし、残りを撥油剤8とすることが好ましい。

【0018】スリーブ1およびシャフト2に塗布された撥油剤8は熱処理にて硬化され、スリーブ1にシャフト2が挿入されて、スリーブ1の一端にスラストフランジ3が取り付けられ、スリーブ1とスラストフランジ3と

の接合領域が接着剤にて封止される。

【0019】そして、シャフト2の外周とスリーブ1の内周との間、スリーブ1とスラスト板2bとスラストフランジ3との間に潤滑油7が充填される。このような流体軸受装置は、スリーブ1の開口部4側に環状の凸部5が形成されているため、撥油剤8の塗布量が多い場合でも凸部5によって撥油剤8の軸受内部側への流入を防止できる。また、スリーブ1およびシャフト2の撥油剤8の塗布領域の表面粗さは他の部分よりも粗く形成されているため、塗布された撥油剤8の付着力が高まり撥油剤8の流動が規制され、塗布領域以外の部分への撥油剤8の付着を低減でき、安定な撥油剤8の塗布が実現できる。

【0020】従って、得られた流体軸受装置は、回転駆動による潤滑油7の飛散や滲み出しを低減して、安定した駆動を実現できる信頼性の高いものとなる。なお、上記説明では、撥油剤8の軸受内部への流入を防ぐために、潤滑油7の液界面付近とスリーブ1の端面1aとの間の区間におけるスリーブ1の内周面に環状の凸部5を形成したが、本発明はこれに限定されるものではなく、図2(b)に示すように、環状の凹部6を形成しても同様の効果が得られる。また、環状の凸部5の厚みや幅は上記のものに限定されるものではなく、その断面形状も任意に設定できる。同様に、凹部6の場合にもその溝深さや断面形状などは特に限定されるものではない。

【0021】また、上記説明では、スリーブ1に環状の凸部5を形成するとともに、撥油剤8の塗布領域の表面粗さを粗くしたが、本発明はこれに限定されるものではなく、スリーブ1に環状の凸部5又は凹部6を形成する、あるいは撥油剤8の塗布領域の表面粗さを粗くするといういずれか一方のみの構成としてもよい。

【0022】

【発明の効果】以上のように本発明の流体軸受装置によると、軸体とこの軸体によって回転自在に支持された回転体との間に潤滑油を充填し、前記潤滑油の液界面付近の軸体もしくは回転体に前記潤滑油の漏洩を防止する撥油剤を塗布した流体軸受装置であって、前記潤滑油の液界面付近と前記撥油剤の塗布領域との間の区間における前記回転体の側に環状の凸部または凹部を形成することで、撥油剤の軸受内部への流入を低減できる。

【0023】あるいは、撥油剤の塗布領域の表面粗さを前記撥油剤が塗布されていない領域の表面粗さよりも粗くすることで、撥油剤の付着力を高めてその流動を規制し、撥油剤の塗布領域以外への撥油剤の付着を低減できる。

【0024】さらに、潤滑油の液界面付近と前記撥油剤の塗布領域との間の区間における前記回転体の側に環状の凸部または凹部を形成するとともに、前記撥油剤の塗布領域の表面粗さを前記撥油剤が塗布されていない領域の表面粗さよりも粗くすることで、軸受内部への撥油剤

の流入や、塗布個所以外への撥油剤の付着を低減できる。

【図面の簡単な説明】

【図 1】 本発明の実施の形態における流体軸受装置の縦断面図

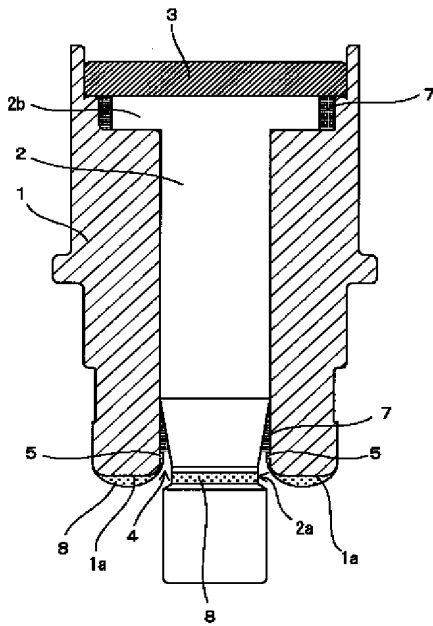
【図 2】 同実施の形態における潤滑剤の液界面付近における要部拡大図

【図 3】 従来の流体軸受装置の縦断面図

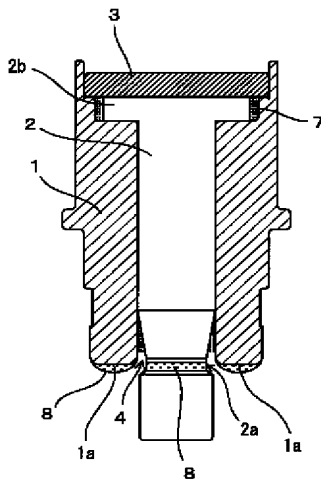
【符号の説明】

- 1 スリーブ
- 2 シャフト
- 2 a 小径部
- 5 凸部
- 6 凹部
- 7 潤滑剤
- 8 撥油剤

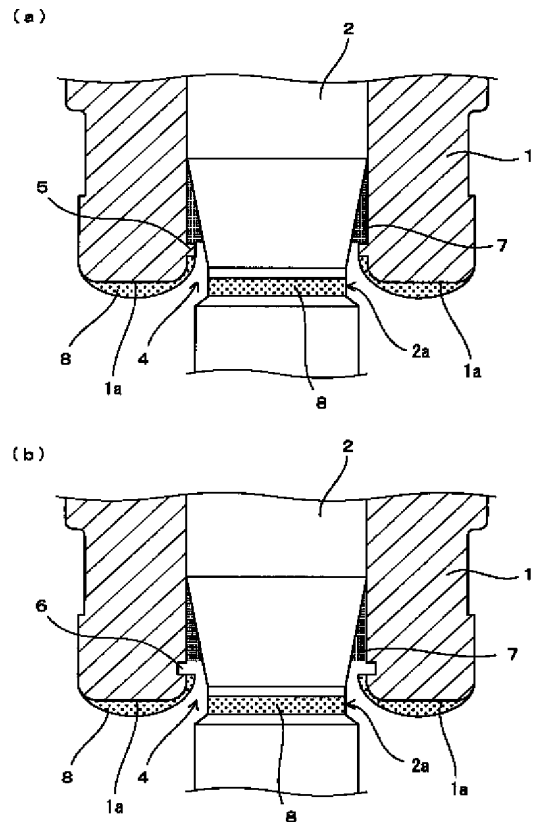
【図 1】



【図 3】



【図 2】



PATENT ABSTRACTS OF JAPAN

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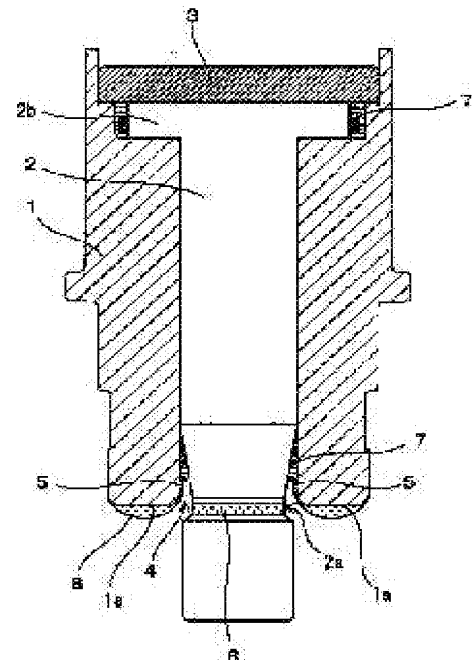
(22)Date of filing : **24.08.2001** (72)Inventor : **TSUGAWA HIDEKI**

(54) HYDRAULIC BEARING

(57)Abstract:

PROBLEM TO BE SOLVED: To provide a hydraulic bearing with high reliability where an air repellent film does not flow into the inside of the bearing nor adheres to unnecessary parts.

SOLUTION: By forming an annular concave on the section of the sleeve 1 between the surrounding of the level of lubrication oil 7 and the painted area of the oil repellent 8, and fluid in of the oil repellent 8 is protected. Surface roughness of the painted area by the oil repellent 8 is made greater than that of the axial body or the rotor unpainted with the oil repellent.



LEGAL STATUS

[Date of request for examination]

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converted registration]
[Date of final disposal for
application]
[Patent number]
[Date of registration]
[Number of appeal against
examiner's decision of rejection]
[Date of requesting appeal against
examiner's decision of rejection]
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CLAIMS

[Claim(s)]

[Claim 1] Liquid bearing equipment which is liquid bearing equipment which applied the oil repellent agent which is filled up with a lubricating oil between an axis and the body of revolution supported free [rotation] with this axis, and prevents leakage of said lubricating oil to the axis or body of revolution near a liquid junction side of said lubricating oil, and formed annular heights or an annular crevice in said body-of-revolution side in the section near the liquid junction side of said lubricating oil, and between the spreading field of said oil repellent agent.

[Claim 2] Liquid bearing equipment made coarser than the surface roughness of said axis with which it is liquid bearing equipment which applied the oil repellent agent which is filled up with a lubricating oil between an axis and the body of revolution supported free [rotation] with this axis, and prevents leakage of said lubricating oil to the axis or body of revolution near a liquid junction side of said lubricating oil, and the surface roughness of the spreading field of said oil repellent agent is not applied to said oil repellent agent, or body of revolution.

[Claim 3] It is filled up with a lubricating oil between an axis and the body of revolution supported free [rotation] with this axis. It is liquid

bearing equipment which applied to the axis or body of revolution near a liquid junction side of said lubricating oil the oil repellent agent which prevents leakage of said lubricating oil. Liquid bearing equipment made coarser than the surface roughness of said axis with which the surface roughness of the spreading field of said oil repellent agent is not applied to said oil repellent agent, or body of revolution while forming annular heights or an annular crevice in said body-of-revolution side in the section near the liquid junction side of said lubricating oil, and between the spreading field of said oil repellent agent.

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DETAILED DESCRIPTION

[Detailed Description of the Invention]

[0001]

[Field of the Invention] This invention relates to the liquid bearing equipment used for spindle motors, such as a magnetic recording medium.

[0002]

[Description of the Prior Art] Liquid bearing equipment is used for spindle motors, such as a magnetic recording medium. As shown in drawing 3 , thrust plate 2b is fixed to the end of a shaft 2, and an axis is constituted. A sleeve 1 is arranged at the periphery of a shaft 2, the thrust flange 3 is attached and body of revolution is constituted so that the end of a sleeve 1 may be countered with thrust plate 2b. The closure of the connection field of a sleeve 1 and the thrust flange 3 is carried out with adhesives. It fills up with a lubricating oil 7 between an axis and a bearing object, and body of revolution is supported free [rotation] with an axis. 4 is opening of a sleeve 1.

[0003] Although held inside bearing with surface tension, if a lubricating oil 7 disperses by the rotation drive of bearing equipment or the

lubricating oil 7 with which it filled up between an axis and body of revolution oozes out, since it will produce the contamination to poor rotation and the exterior of bearing, the oil repellent agent which crawls a lubricating oil 7 was applied near the liquid junction side of a lubricating oil 7 like the publication to JP,7-31094,A etc., lubricant 7 oozed out, and it has prevented *****. Here, the oil repellent agent 8 is applied to end-face 1a of a sleeve 1 and narrow diameter portion 2a of a shaft 2 in near the liquid junction side of a lubricating oil 7.

[0004]

[Problem(s) to be Solved by the Invention] However, the oil repellent agent 8 had the problem that stable spreading, such as adhering to a part without the need of applying in case it is inferior to the spreading nature and an oil repellent agent 8 is applied to narrow diameter portion 2a of the end face of a sleeve 1 or a shaft 2 in near the liquid junction side of a lubricating oil 7 as mentioned above, or flowing into the interior of bearing and mixing in a lubricating oil 7 when there is much coverage, could not be performed.

[0005] Therefore, although the method of diluting an oil repellent agent 8 with a solvent, raising a fluidity, and raising workability is taken, when adjustment of dilution is difficult and dilutes too much, it may adhere also to the part which the oil repellent agent 8 after spreading flows, and does not need spreading of an oil repellent agent 8, retouching processes, such as a wiping activity, are needed, and there is a problem of requiring a great man day.

[0006] It aims at offering liquid bearing equipment with the high dependability which this invention solves said trouble, does not have the inflow to the interior of bearing of an oil repellent agent, and moreover does not have adhesion in an unnecessary part.

[0007]

[Means for Solving the Problem] The liquid bearing equipment of this invention is characterized by forming the heights or the crevice which prevents the inflow to the interior of bearing of an oil repellent agent to the body of revolution in the section near the liquid junction side of a lubricating oil, and between the spreading field of an oil repellent agent.

[0008] According to this configuration, the inflow to the interior of bearing of an oil repellent agent is prevented, and reliable liquid bearing equipment can be realized. The liquid bearing equipment of this invention is characterized by making it coarser than the surface roughness of the field to which the surface roughness of the spreading field of an oil repellent agent is not applied.

[0009] Since the oil repellent agent which heightened the adhesion force of an oil repellent agent and was stabilized can be applied according to this configuration, reliable liquid bearing equipment is

realizable. The liquid bearing equipment of this invention is characterized by making it coarser than the surface roughness of the field to which the surface roughness of the spreading field of an oil repellent agent is not applied while it forms the heights or the crevice which prevents the inflow of an oil repellent agent to the body of revolution in the section near the liquid junction side of a lubricating oil, and between the spreading field of an oil repellent agent.

[0010] According to this configuration, much more reliable liquid bearing equipment is realizable.

[0011]

[Embodiment of the Invention] The liquid bearing equipment of this invention according to claim 1 is filled up with a lubricating oil between an axis and the body of revolution supported free [rotation] with this axis. It is liquid bearing equipment which applied to the axis or body of revolution near a liquid junction side of said lubricating oil the oil repellent agent which prevents leakage of said lubricating oil, and is characterized by forming the heights or the crevice of said body of revolution in the section near the liquid junction side of said lubricating oil, and between the spreading field of said oil repellent agent annular to a side.

[0012] The liquid bearing equipment of this invention according to claim 2 is characterized by to make it coarser than the surface roughness of said axis with which it is liquid bearing equipment which applied the oil repellent agent which is filled up with a lubricating oil between an axis and the body of revolution supported free [rotation] with this axis, and prevents leakage of said lubricating oil to the axis or body of revolution near a liquid junction side of said lubricating oil, and the surface roughness of the spreading field of said oil repellent agent is not applied to said oil repellent agent, or body of revolution.

[0013] The liquid bearing equipment of this invention according to claim 3 is filled up with a lubricating oil between an axis and the body of revolution supported free [rotation] with this axis. It is liquid bearing equipment which applied to the axis or body of revolution near a liquid junction side of said lubricating oil the oil repellent agent which prevents leakage of said lubricating oil. While forming annular heights or an annular crevice in said body-of-revolution side in the section near the liquid junction side of said lubricating oil, and between the spreading field of said oil repellent agent It is characterized by making it coarser than the surface roughness of said axis with which the surface roughness of the spreading field of said oil repellent agent is not applied to said oil repellent agent, or body of revolution.

[0014] Below, the gestalt of operation of this invention is explained using drawing 1 and drawing 2 . In addition, the same sign is attached

and explained to what makes the same configuration as drawing 3 which shows the above-mentioned conventional example.

[0015] As shown in drawing 1 , as shown in drawing 2 (a), in the liquid bearing equipment constituted like drawing 3 , the annular heights 5 are formed with the gestalt of this operation as the guard section which regulates the inflow to the interior of bearing of an oil repellent agent 8 to the inner skin of the sleeve 1 in the section near the liquid junction side of a lubricating oil 7, and between the spreading field of an oil repellent agent 8. The annular heights 5 are formed here so that the thickness may be set to about 0.02mm and width of face may be set to about 0.5mm.

[0016] Moreover, the surface roughness of the field where the oil repellent agent 8 applied to heights 5 from end-face 1a of a sleeve 1 is applied is formed so that the adhesion force of an oil repellent agent 8 may be heightened, and a flow of an oil repellent agent 8 may be regulated, and it may become larger than the surface roughness of other parts of a sleeve 1, and further, rather than other parts of a shaft 2, the surface roughness of narrow diameter portion 2a of a shaft 2 is also formed for the surface roughness so that it may become large. Specifically, surface roughness of the part by which surface roughness of the spreading field of the oil repellent agent 8 of a sleeve 1 and a shaft 2 is not applied to 2 micrometers – about 6 micrometers and an oil repellent agent 8 is set to about 0.35 micrometers.

[0017] Thus, the constituted liquid bearing equipment is produced as follows. The oil repellent agent 8 diluted with the solvent so that the suitable fluidity for the spreading field applied to end-face 1a from the heights 5 of the sleeve 1 by which the annular heights 5 were formed in the inner skin by the side of opening 4 might be acquired is applied with the brush etc. Moreover, an oil repellent agent 8 is similarly applied about narrow diameter portion 2a of a shaft 2. Although neither an oil repellent agent 8 nor especially a solvent is limited, as for the dilution ratio of an oil repellent agent 8, it is desirable to use 90% or more as a solvent, and to make the remainder into an oil repellent agent 8.

[0018] The oil repellent agent 8 applied to the sleeve 1 and the shaft 2 is hardened by heat treatment, a shaft 2 is inserted in a sleeve 1, the thrust flange 3 is attached in the end of a sleeve 1, and the closure of the junction field of a sleeve 1 and the thrust flange 3 is carried out with adhesives.

[0019] And it fills up with a lubricating oil 7 between a sleeve 1, thrust plate 2b, and the thrust flange 3 between the periphery of a shaft 2, and the inner circumference of a sleeve 1. Since the annular heights 5 are formed in the opening 4 side of a sleeve 1, such liquid bearing equipment can prevent the inflow by the side of the interior of bearing

of an oil repellent agent 8 by heights 5, even when there is much coverage of an oil repellent agent 8. Moreover, since the surface roughness of the spreading field of the oil repellent agent 8 of a sleeve 1 and a shaft 2 is formed more coarsely than other parts, the adhesion force of the applied oil repellent agent 8 increases, a flow of an oil repellent agent 8 can be regulated, and it can reduce adhesion of the oil repellent agent 8 to parts other than a spreading field, and can realize spreading of the stable oil repellent agent 8.

[0020] Therefore, the obtained liquid bearing equipment becomes the thing which has high dependability and which can realize scattering and the drive which oozed, reduced ** and was stabilized of the lubricating oil 7 by rotation drive. In addition, in the above-mentioned explanation, in order to prevent the inflow to the interior of bearing of an oil repellent agent 8, the annular heights 5 were formed in the inner skin of the sleeve 1 in the section near the liquid junction side of a lubricating oil 7, and between edge 1a of a sleeve 1, but the same effectiveness is acquired even if it forms the annular crevice 6, as this invention is not limited to this and shown in drawing 2 (b). Moreover, the thickness or width of face of the annular heights 5 are not limited to the above-mentioned thing, and can also set the cross-section configuration as arbitration. Similarly, in the case of a crevice 6, especially the channel depth, cross-section configuration, etc. are not limited.

[0021] Moreover, although surface roughness of the spreading field of an oil repellent agent 8 was made coarse in the above-mentioned explanation while forming the annular heights 5 in the sleeve 1, this invention is good also as one of it not being limited to this, and forming annular heights 5 or an annular crevice 6 in a sleeve 1, or making coarse surface roughness of the spreading field of an oil repellent agent 8 of configurations.

[0022]

[Effect of the Invention] According to the liquid bearing equipment of this invention, it is filled up with a lubricating oil as mentioned above between an axis and the body of revolution supported free [rotation] with this axis. It is liquid bearing equipment which applied to the axis or body of revolution near a liquid junction side of said lubricating oil the oil repellent agent which prevents leakage of said lubricating oil. By forming annular heights or an annular crevice in said body-of-revolution side in the section near the liquid junction side of said lubricating oil, and between the spreading field of said oil repellent agent, the inflow to the interior of bearing of an oil repellent agent can be reduced.

[0023] Or by making it coarser than the surface roughness of the field where the surface roughness of the spreading field of an oil repellent agent is not applied to said oil repellent agent, the adhesion force of an

oil repellent agent is heightened, the flow is regulated, and adhesion of oil repellent agents other than the spreading field of an oil repellent agent can be reduced.

[0024] Furthermore, while forming annular heights or an annular crevice in said body-of-revolution side in the section near the liquid junction side of a lubricating oil, and between the spreading field of said oil repellent agent, the inflow of the oil repellent agent inside bearing and adhesion of the oil repellent agent to the outside of a spreading individual reason can be reduced by making it coarser than the surface roughness of the field where the surface roughness of the spreading field of said oil repellent agent is not applied to said oil repellent agent.

[Translation done.]

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DESCRIPTION OF DRAWINGS

[Brief Description of the Drawings]

[Drawing 1] Drawing of longitudinal section of the liquid bearing equipment in the gestalt of operation of this invention

[Drawing 2] The important section enlarged drawing in near the liquid junction side of the lubricant in the gestalt of this operation

[Drawing 3] Drawing of longitudinal section of conventional liquid bearing equipment

[Description of Notations]

- 1 Sleeve
- 2 Shaft
- 2a Narrow diameter portion
- 5 Heights
- 6 Crevice
- 7 Lubricant
- 8 Oil Repellent Agent

[Translation done.]

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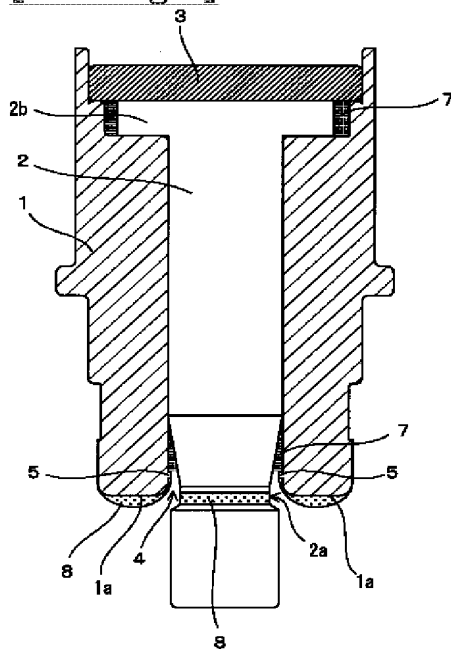
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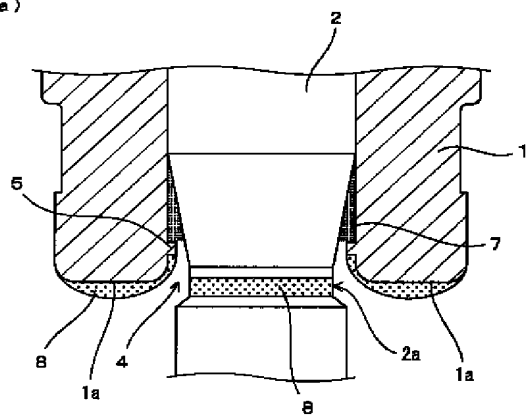
DRAWINGS

[Drawing 1]

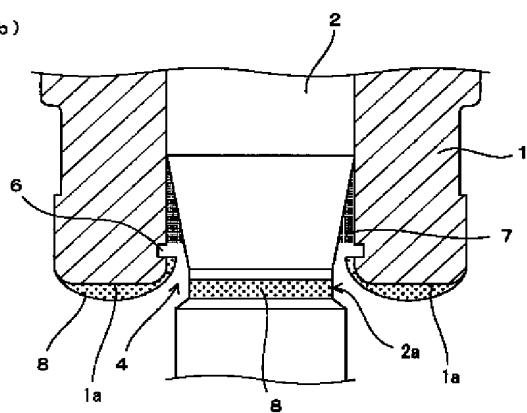


[Drawing 2]

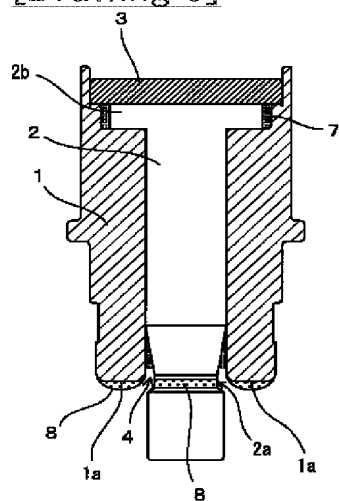
(a)



(b)



[Drawing 3]



[Translation done.]